BC Tungsten Deposits

The British Columbia Ministry of Energy, Mines and Petroleum Resources' MINFILE database lists 366 tungsten-bearing occurrences in the province. This includes past producers (82), developed prospects (28), prospects (63) and showings (192). Total tungsten production (1900 to 1982) from 12 mines is approximately 8 552 000 kilograms. Total existing in-ground resources in 9 deposits are estimated at 34 572 100 kilograms tungsten.

Prior to the early 1940s, exploration and development of tungsten deposits in the province was pretty well limited to small quantities from either primary producers, or as byproducts. However, the expanded need for Canada's most strategic metal leading up to the Second World War led to increased exploration and discovery of tungsten deposits. Tungsten deposits in the province were well documented in Bulletin No. 10 (see "References"), but almost no comprehensive update has been published since the Second World War.

Regional geochemical surveys and mapping programs by the Geological Survey Branch, since the 1970s in particular, have provided much valuable knowledge in tungsten bearing deposits in the province. With the discovery of numerous porphyry molybdenum (± tungsten) deposits, particularly in the 1970s and 1980s, this type of deposit represents a potential new significant source of by-product tungsten (e.g. Davidson, Logtung)

Recent exploration on more traditional tungsten-bearing sources such as skarn or replacement types, has led to significant advancements (e.g. Emerald/Dodger). Further exploration and developments are expected.

Tungsten **skarns [K05]*** are mainly Mesozoic in age. Over 70% of the tungsten skarns in BC are related to Cretaceous intrusions. Scheelite-dominant mineralization is genetically associated with a skarn gangue. Deposits vary from 0.1 to > 30 Mt; grades range between 0.4 and 2% WO_3 (typically 0.7%).

Polymetallic vein [I05]* types are mainly Cretaceous to Tertiary in BC. Scheelite occurs in quartz veins with pyrite, with or without galena, sphalerite and chalcopyrite. Many occur peripheral to molybdenite-rich intrusive-hosted deposits (e.g. Trout Lake area).

Tungsten **veins [I12]*** occur as epithermal, mesothermal and hypothermal types; each type has different characteristics. Scheelite-bearing quartz veins occur in the Red Rose, Black Diamond and Valparaiso deposits.

Gold-quartz veins [I01]* are mainly Middle Jurassic and Late Cretaceous in age. Scheelite-bearing veins occur in Bridge River Group and Snowshoe Group rocks.

Porphyry molybdenum ± tungsten [L08]* deposits are Cretaceous to Tertiary in age. Stockwork of Mo ± W - bearing quartz veinlets and fractures occur in felsic intrusive rocks. Deposits are low grade but in large tonnages can be amenable to bulk mining methods either surface or underground (e.g. Logtung, Davidson).

***Note:** BCMEMPR Mineral Deposit Type

RED ROSE

- Mining: 1942 - 1954
- Produced 977 500 kg of W, plus 19.3 kg of Au and 26.8 kg of Ag from 110 800 tonnes milled
- Indicated resources: 13 600 t grading 1.18% W
- Host rocks are hornfelsed sediments that have been intruded by the Rocher Deboule granodiorite batholith
- 1.2 to 2.8 m vein has been traced 60 to 120 m along strike and at least 335 m down dip

EMERALD/DODGER

- Production began in 1906 as a lead-zinc mine
- Tungsten-bearing, garnet-diopside skarn
- Scheelite with pyrrhotite, molybdenite and/or powellite.
- Dodger mine operated 1951 to 1958, and also 1970 to 1973.
- New Emerald resources in 2006

For more Information (selected references):

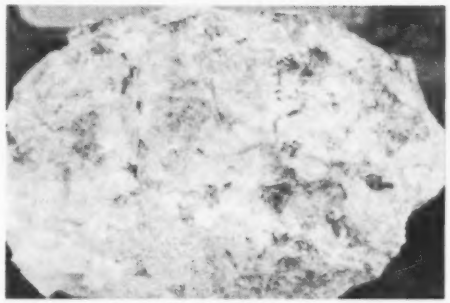
www.em.gov.bc.ca/Mining/Geolsurv (604) 660-2812

Selected British Columbia Mineral Deposit Profiles (1995): Volume 1- Metallics and Coal. BC Ministry of Energy, Mines and Petroleum Resources, Open File 1995-20.

Stevenson, J.S. (1943): Tungsten Deposits of British Columbia. BC Ministry of Energy, Mines and Petroleum Resources, Bulletin No. 10, 174 pages.

Produced by: T.G. Schroeter and E. Man, Mar. 2007

Tungsten
In
British Columbia



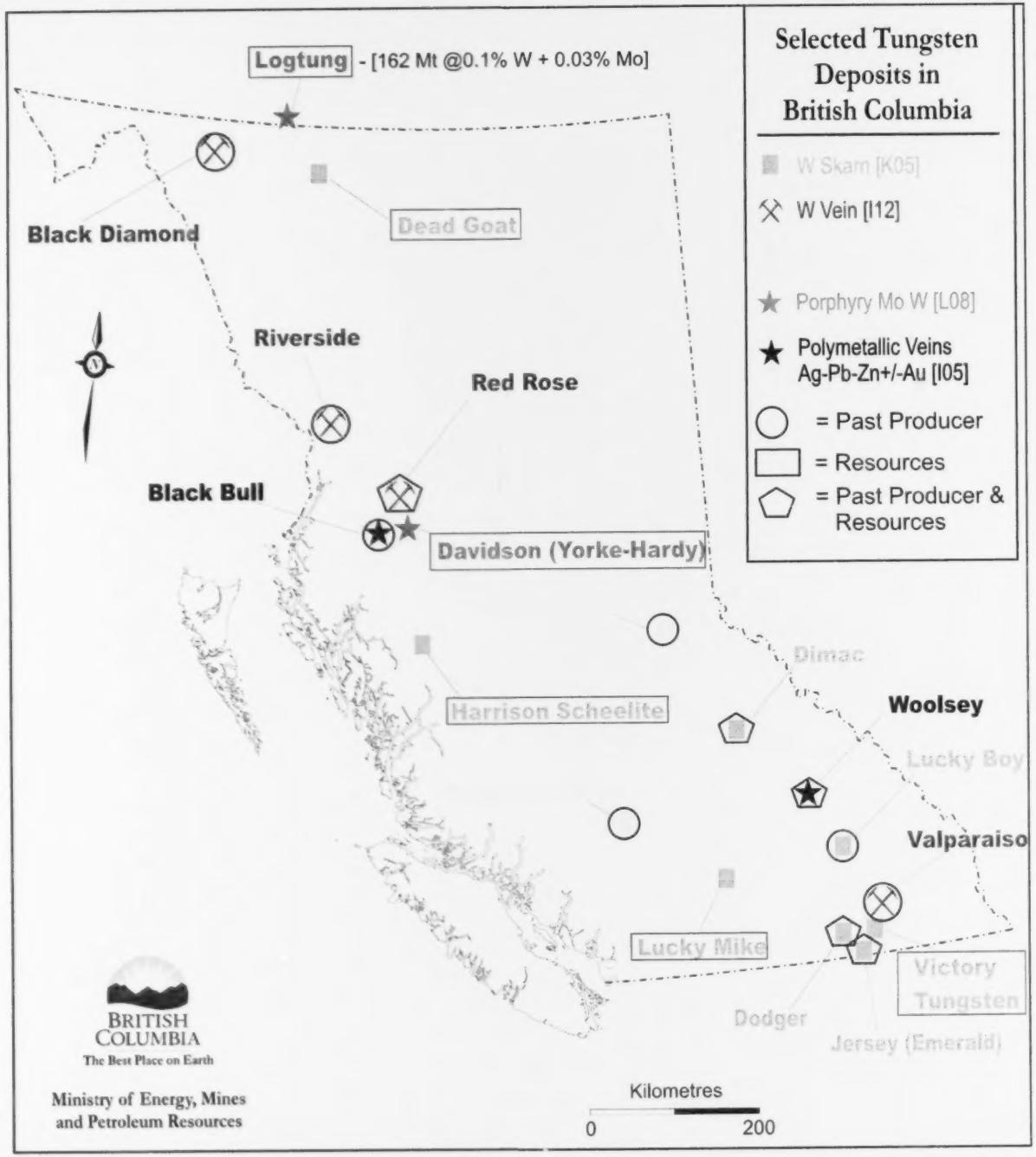
(Coarse-grained scheelite, Davidson)

(Brain rock, Davidson)

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Energy, Mines and Petroleum Resources

Information Circular 2007-3



Selected Tungsten Deposits in British Columbia

- W Skarn [K05]
- W Vein [I12]
- Porphyry Mo W [L08]
- Polymetallic Veins Ag-Pb-Zn+/-Au [I05]
- = Past Producer
- = Resources
- = Past Producer & Resources

Past Tungsten Production, By Rank

MINE	YEARS	MILLED t (x10³)	Gold (kg)	Silver (kg)
JERSEY (EMERALD)	1944-1970	8 128.8		21 483
DODGER	1971-1972	336.2		
RED ROSE	1942-1954	110.8	19.3	26.8
DIMAC	1982	18.3		
RIVERSIDE	1927-1950	25.1	81.9	2 975.8
HARDSCRABBLE	1939-1941	1.1		
TUNGSTEN QUEEN	1953	0.055		
VALPARAISO	1900-1955	0.5	3.7	37.8
BLACK DIAMOND	1943	0.001		
WOOLSEY	1930-1967	5.5	0.062	347.6
LUCKY BOY	1902-1976	0.473	0.031	3 097.4
BLACK BULL	1940-1942	0.003	0.031	0.062

Selected BC Tungsten Deposits Ranked by Contained Tungsten

Mine	Estimated Tonnage t (x10³)		Grades % Mo	g t Ag
*DAVIDSON (YORKE-HARDY)	M + I	75 300	0.177	
*JERSEY (EMERALD)		3 374		
LUCKY MIKE	I	317.4		20.5
DEAD GOAT	I	100.9		
VICTORY TUNGSTEN	I	74.3		
RED ROSE	I	13.6		
WOOLSEY	I	590.7		71.6
DIMAC	I	9.07		
HARRISON SCHEELITE	I	21.1		

*43-101 Compliant M = Measured, I = Indicated, Inf. = Inferred

Sample Media Characteristics ...

Fine-grained stream-sediment is the preferred sample medium in B.C. due to its widespread availability, ease of collection and analysis, and its ability to provide representative geochemical data for the drainage basin upstream from the sample site.

Moss-mat sediment is collected in areas, such as Vancouver Island, where conventional stream sediment is either scarce or not available. Living mosses, found in the stream channel below the high water level, filter suspended sediment from the stream water.

Lake sediment is collected in area s of low relief where streams are either nonexistent or very low energy. Stream and lake water samples are routinely taken as part of regional surveys. Ground water samples may be collected during more detailed geochemical surveys.

Application and Uses ...

Regional geochemical surveys are an established exploration tool which have been credited with numerous mineral discoveries. Exploration and development of B.C.'s mineral resources is the primary objective of the **RGS** Program. The **RGS** database is also used to :

- Outline regional geochemical trends and assist regional metallogenic studies and geological interpretations
- Assist in the evaluation of mineral potential and aid resource management and land-use planning initiatives.
- Provide background geochemical data useful for environmental assessments.

Where to access RGS information ...

RGS data for all of the survey areas can be downloaded by the public from the Ministry of Energy and Mines, Geological Survey Branch Web Site: (http://www.empr.gov.bc.ca/Mining/Geoscience/). It is also accessible through the Ministry's Map Place portal: (http://www.empr.gov.bc.ca/Mining/Geoscience/MapPlace/) where selected element values can be viewed in relation to other themes including bedrock geology, geophysics, MINFILE mineral occurrence locations, topography and drainage.

Since the first publication of RGS data in 1977 survey results have been presented in a variety of hard-copy formats. More recently, survey results are distributed on a compact disc where the text and maps can be printed form PDF format files. Digital data is also available in a number of formats.

TO PURCHASE RGS REPORTS CONTACT :

Crown Publications, Queens Printer, BC.
106 Ontario Street
Victoria, B.C. V8W 1M9
Telephone : (250) 386-4636
Fax : (250) 386-0221

FOR MORE INFORMATION CONTACT:

Ray Lett, Geological Survey
P.O. Box 9333
Stn Prov Gov't
Victoria B.C. V8W 9N3
Email Ray.Lett@gov.bc.ca
Telephone : (250) 952-0396
Fax : (250) 952-0381

World Wide Web Site :
http://www.empr.gov.bc.ca/Mining/Geoscience/Geochemistry/

RGS

British Columbia Regional Geochemical Survey Database

BRITISH COLUMBIA GEOLOGICAL SURVEY

BRITISH COLUMBIA
Canada's Pacific Gateway

Ministry of Energy, Mines and Petroleum Resources

RGS

INFORMATION CIRCULAR 2009-2

RGS Program Summary ...

The B.C. Ministry of Energy and Mines Regional Geochemical Survey **(RGS)** Program develops, maintains and disseminates a comprehensive geochemical database consisting of stream- sediment, moss-sediment, lake-sediment, stream-water and lake-water analytical data plus field site observations.

Data from joint federal-provincial reconnaissance-scale geochemical surveys have been systematically collected, compiled and regularly published in B.C. since 1976. Survey standards are based on the National Geochemical Reconnaissance Program which was originally developed by the Geological Survey of Canada.

Currently, the **RGS** database contains determinations for up to 60 metals, field observations and sample location coordinates for 59 633 sample site locations covering over 70 per cent of the province. These data are used in the exploration and development of B.C.'s mineral resources, resource management and land-use planning, and environmental assessments.

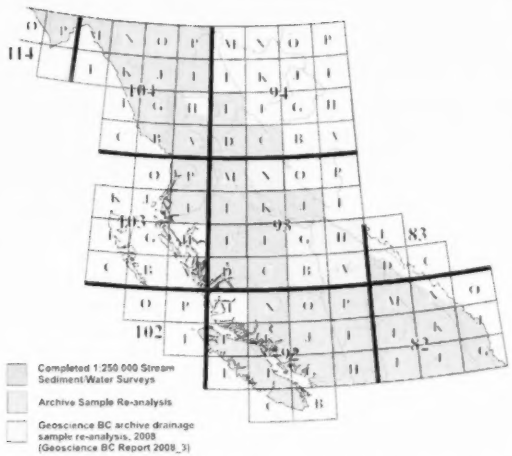
Regional Geochemical Surveys ...

Regional geochemical surveys provide a representative measurement of the concentration of metals in the environment. Resultant data illustrate the natural metal variability of the Earth (geochemistry) and highlight areas of elevated or depleted concentrations of metals (geochemical anomalies).

The **RGS** Program commonly evaluates areas covering in excess of 10,000 square kilometres. Samples are collected from first or second order catchment basins which have an average area of 10 to 13 square kilometres.

The RGS Database ...

Your gateway to new exploration targets


Completed 1:250 000 Stream Sediment/Water Surveys
Archive Sample Re-analysis
Geoscience BC archive drainage sample re-analysis, 2008 (Geoscience BC Report 2008_3)

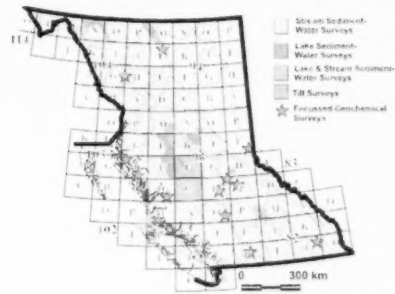
- Quality control procedures are routinely conducted to ensure data integrity is maintained for each component of the RGS program.
- Field site checks are conducted by Ministry personnel to monitor, control and assess sample collection activities. Samples are evaluated during sample preparation for quality and quantity of fine-grained sediment material.
- Sediment samples are analyzed using aqua regia-atomic absorption spectrophotometry (AAS) and instrumental neutron activation analysis (INAA). Inductively coupled plasma mass spectrometry (ICPMS) has replaced AAS in RGS surveys carried out after 2002. Analytical duplicate samples and control reference materials are inserted into each analytical block of 20 samples before analysis. Analytical results for field-site duplicates, analytical duplicates and control reference materials are closely monitored and evaluated.
- New drainage surveys and archive sample re-analysis has been undertaken by Geoscience BC after 2006 and the results incorporated into the RGS database.

Database Summary ...

Survey Area	Package I.D.	Sample Sites	Sample Media	Original RGS Release	Additional Post Release Element Analyses	Water Analyses	Update Release
82E	RGS 29	1545	SS,SW	1977		U,F,pH	1991
82F	RGS 30	1318	SS,SW	1978	Sn,Hg	U,F,pH	1991
82G	RGS 27	924	SS,SW	1991	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr	U,F,pH,SO4	1991
82J	RGS 28	588	SS,SW	1991	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr	U,F,pH,SO4	1991
82K	RGS 31	1225	SS,SW	1978	Sn,W,Hg	U, F, pH	1991
82L	RGS 32	1309	SS,SW	1977		U, F, pH	1991
82M	RGS 33	1151	SS,SW	1978	Hg	U, F, pH	1991
83C/D/E	GF 2006-12	1409	SS,SW	2006	ICPMS & INAA	F,pH,CND	N/A
82N	GF 2006-12	1409	SS,SW	2006	ICPMS & INAA	F,pH,CND	N/A
92B/C	RGS 24	599	MS,SW	1990	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr, Au	U, F, pH	N/A
92E	RGS 21	386	MS,SW	1989	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	N/A
92F	RGS 25	909	MS,SS,SW	1990	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	N/A
92G	RGS 26	855	SS,SW	1990	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	2006
92H	RGS 39	940	SS,SW	1982	W,Hg,As,Sb	U, F, pH	1994
92I	RGS 40	572	SS,SW	1982	W,Hg,As,Sb	U, F, pH	1994
92J	RGS 41	806	SS,SW	1982	W,Hg,As,Sb	U, F, pH	1994
92K	RGS 22	1216	MS,SS,SW	1989	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	2006
92L/102I	RGS 23	1144	MS,SS,SW	1989	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	2006
92N	RGS 34	820	SS,SW	1992	Sn,W,Hg,As,Sb,Cd,V,LOI,F,Bi,Cr	U,F,pH,SO4	1992
92O	RGS 35	885	SS,SW	1980	W,Hg,As	U, F, pH	1992
92P	RGS 36	863	SS,SW	1980	W,Hg,As	U, F, pH	1992
93A	RGS 50	1219	SS,SW	1981	W,Hg,As,Sb	U, F, pH	1999
93B	RGS 06	715	SS,SW	1981	W,Hg,As,Sb	U, F, pH	2001
93C/F	GF 2006-11	1409	SS,SW	2006	ICPMS & INAA (GF 2006-10)	F,pH,CND	
93D/103A	RGS 56	1180	SS,SW	2002	ICPMS, INAA,ICPMSWater(GF2006-10)	U, F, pH	
93E	RGS 16	1112	SS,LS,SW,LW	1987	W,Hg,As,Sb,Ba,Cd,LOI,Au	U, F, pH	
93G	RGS 13	1095	SS,SW	1986	W,Hg,As,Sb,Ba,Cd,V,LOI	U, F, pH	2002
93H	RGS 14	1119	SS,SW	1986	W,Hg,As,Sb,Ba,Cd,V,LOI	U, F, pH	2002
93J	RGS 15	1088	SS,SW	1986	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI	U, F, pH	
93K	RGS 57	795	SS,SW	2003	ICPMS, INAA,ICPMSwater	U,F,pH	
93L	RGS 17	1093	SS,LS,SW,LW	1987	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Au	U, F, pH	
93M	RGS 48	1037	SS,SW	1984	W,Hg,As,Sb	U, F, pH	1998
93N	RGS 49	1060	SS,SW	1984	W,Hg,As,Sb	U, F, pH	1998
94C	RGS 47	1008	SS,SW	1998	Hg,As,Sb,Cd,V,LOI,F,Bi	U,F,pH,SO4	1998
94D	RGS 45	976	SS,SW	1997	Hg,As,Sb,Cd,V,LOI,F,Bi (GF2005-11)	U,F,pH,SO4	1997
94E	RGS 46	909	SS,SW	1997	Hg,As,Sb,Cd,V,LOI,F,Bi (GF2005-11)	U,F,pH,SO4	1997
103I/J	RGS 42	2128	SS,SW	1979	W,Hg,As, ICPMS (GSBC2008-11)	U, F, pH	1995
103O/P	RGS 43	1780	SS,SW	1979	W,Hg,As	U, F, pH	1995
104A/H	RGS 58	1385	SS,SW	2005	ICPMS, INAA,ICPMSWater		
104B	RGS 18	660	SS,SW	1988	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	
104F/G	RGS 19	1219	SS,SW	1988	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	
104I	RGS 44	1159	SS,SW	1996	Hg,As,Sb,Cd,V,LOI,F,Bi	U,F,pH,SO4	1996
104J	RGS 55	908	SS,SW	2000	ICPMS, INAA,ICPMSWater	U,F,pH,SO4	
104K	RGS 20	847	SS,SW	1988	Sn,W,Hg,As,Sb,Ba,Cd,V,LOI,F,Bi,Cr,Au	U, F, pH	
104M	RGS 37	741	SS,SW	1993	Hg,As,Sb,Cd,V,LOI,F,Bi	U,F,pH,SO4	1993
104N	RGS 51	885	SS,LS,SW,LW	1978	Sn,W,Hg	U, F, pH	2000
104O	RGS 52	892	SS,LS,SW,LW	1979	W	U, F, pH	2000
104P	RGS 53	802	SS,SW	1979	W	U, F, pH	2000
114O/P	2006_04	1065	SS,SW	2006	Hg,As,Sb,Cd,V,LOI,F,Bi	U,F,pH,SO4	2006

Sample Media: SS=Stream Sediment, MS=Moss Sediment, LS=Lake Sediment, SW=Stream Water, LW=Lake Water
AAS Suite: Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, Mo, U **Routine Water:** pH, F, SO$_4$, U, Conductivity
INAA Suite: Au, Sb, As, Ba, Br, Ce, Cs, Cr, Co, Hf, Fe, La, Lu, Mo, Ni, Rb, Sm, Sc, Na, Ta, Th, W, U, Yb, Zr
ICPMS Suite: Au, Al, Sb, As, Bi, Ba, Cd, Ca, Cr, Co, Ga, Fe, Hg, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sc, Sr, Te, Ti, Th, Tl, W, U, V, Zn
ICPMS Water Suite: Al, Sb, As, Ba, Be, B, Ce, Cs, Cr, Co, Cu, Dy, Er, Gd, La, Pb, Li, Mn, Mo, Nd, Ni, Pr, Rb, Sm, Sr, Tl, U, V, Yb, Y, Zn, Ca, Fe, Mg, K, Si, Na, S

Adding Value to the RGS...



Results of sampling at a density higher than 1:250 000 reconnaissance scale stream sediment and water surveys or using other media such as lake sediment add value to the RGS database. These surveys are applied to areas where conventional stream sediment sampling is unsuitable or to determine the geochemical signature of a specific mineral deposit. Focussed surveys that have been published as BC Geological Survey Open Files and Geofiles include the results lake sediment, soil, till and stream sediment heavy mineral concentrate sampling.